Enrolment No._____

HASMUKH GOSWAMI COLLEGE OF ENGINEERING, VAHELAL

MID SEMESTER EXAMINATION, SEPTEMBER-2016

Subject Code: 2131905 **Date: 28/09/2016**

Subject Name: Engineering Thermodynamics **Sem: 3RD**

Time: 10:00 TO 10:50 **Total Marks: 20**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

QUE.1 **(A)** Explain Microscopic approach and macroscopic approach. **3**

(B) Derive general steady flow energy equation. **3**

QUE.2 **(A)** Show that coefficient of performance of heat pump and refrigerator can be related as; $COP_{Ref} = COP_{HP} - 1$ **3**

(B) Write the limitation of first law of thermodynamics. Explain the second law of thermodynamics by Clausius statement and Kelvin-Plank statement. **4**

OR

(B) A turbine operating under steady flow conditions receives steam at a velocity of 50 m/s and elevation of 5 m and a specific enthalpy of 2700 KJ/kg. The steam leaves the turbine at a velocity of 83.3 m/s, an elevation of 1.5 m and a specific enthalpy of 2250 kJ/kg. Heat losses from the turbine to the surroundings amount to 1.41 kJ/hr. Determine the mass flow rate of steam required in kg/hr for output power of 360 kW **4**

QUE.3 **(A)** Draw Rankine cycle on P-v, T-s diagrams and derive an expression for its thermal efficiency with and without pump work. **3**

(B) Derive an expression for Otto cycle efficiency with usual notation. **4**

OR

(A) Derive an expression for Carnot efficiency with usual notation. **3**

(B) In an air standard diesel cycle the compression ratio is 16. At the beginning of isentropic compression the temperature is 15^0C and pressure is 0.1 MPa. Heat is added until the temperature at the end of constant pressure process is 1480^0C Calculate (1) Cut off ratio. (2) Cycle efficiency (3) M. E. P. Take $\gamma = 1.4$, R = 287 NM/Kg K, Cv = 0.718 KJ/Kg K, CP =1.005 KJ/Kg K Assume Mass of air = 1 Kg **4**

********** ALL THE BEST **********